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(54) Ice Hockey Stick

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TITLE: IMPROVED ICE HOCKEY STICK

ABSTRACT OF THE DISCLOSURE

An improved ice hockey stick is disclosed which is made with a handle component whose lower end tapers to fit closely into a closely conforming groove in the rear edge of a hard wood blade. The handle component may be made of hardwood or it may be made of foam injected plastic material in accordance with another aspect of the subject matter disclosed. The foam injected handle component has a centrally located filler member and, on each side, a reinforcing strip of unidirectional strands of fibers in a suitable bonding agent mounted flush with the wide sides of the handle. A process for making a foam injected plastic component is disclosed as well as a method of making an ice hockey stick using the novel joint applicable to conventional hardwood handle components and to foam injected plastic handle components.

This is a divisional of canadian patent application number 418,423 filed December 23, 1982.

This invention relates to improved ice hockey sticks such as used for playing the well-known game of ice hockey.

Ice Hockey sticks are normally made of hardwood and comprise an elongated handle of rectangular cross-section and a blade permanently secured at a given obtuse angle to the lower end of the handle by means of a suitable glued joint and of a wrapping of glass fiber in an epoxy resin. The cost of hardwood handles and of reinforced hardwood handles becomes increasingly high on account of the limited supply of high quality hardwood suitable for this application and on account of the cost of labour and of raw material required for making wood laminates suitable as handle components, and the cost increases further when use is made of longitudinally extending reinforcing means such as reinforcing strips to strengthen the handle of the finished product.

Various attempts have been made in the past in order to produce handles for ice hockey sticks which do not require the use of expensive wood, but hitherto these attempts failed to produce commercially successful products at competitive prices.

The primary object of the present invention is to produce a handle for an ice hockey stick of professional caliber which is commercially feasible and which may be mass produced at relatively low cost as compared to the cost of the handle components used for producing commercially acceptable hockey sticks.

In accordance with this invention, an ice hockey stick handle component is provided which is made of foam injected plastic material of suitable density having a filler member centrally located in the handle component and a reinforcing strip of unidirectional strands of fibers in a suitable bonding agent embedded centrally on each side of the handle component. The preferred foam plastic materials are polyurethane, polyethylene and polypropylene.

The invention also provides a novel method of joining a handle component and a blade component which is suitable for use in connection with a foam injected reinforced handle component. In accordance with this novel joint, the handle component terminates at its lower end with a gradual taper on each side thereof and a complementary groove is made in the rear edge of the hardwood blade for permanently receiving and retaining by glue the tapered portion of the handle component.

The invention therefore provides a process for producing a foam injected plastic injected component and also a method of joining together such a plastic handle component and a conventional hardwood blade.

The invention also proposes to adapt the above-mentioned novel joint to the making of ice hockey sticks using conventional hardwood handle components.

A preferred embodiment of the present invention will now be described in detail with reference to the accompanying drawings wherein:

Figure 1 is a perspective view of an ice hockey stick made in accordance with this invention;
Figure 2 is a partial perspective view of the upper end of a foam injected plastic handle component;
Figure 3 is a cross-sectional view taken along line 3-3 of Figure 1;
and Figure 4 is a perspective exploded view of a handle component showing a tapered end, and of a blade component showing a V-shaped groove in the rear edge thereof for receiving the tapered end of the handle component.

Referring now to the drawings, the ice hockey stick 10 shown in Figure 1 is made of an elongated rigid handle 12 having a tapered lower end portion 14, and a blade 16 permanently secured to the tapered end 14 of handle 12. Handle component 12 is also visible in partial perspective view in Figure 2 and in cross-sectional view in Figure 3. It consists of an elongated body of foam injected plastic material 20 filled with a longitudinally extending filler member 22 and, centrally on each side of handle component 12, a flush reinforcing strip 24,26 of unidirectional strands of fibers in a suitable bonding agent. In cross-section, handle 12 is essentially rectangular and constant throughout its length except at its lower tapered end portion 14 where the two sides (one of which is shown at 29) gradually taper inwardly as illustrated in Figure 4. As in conventional ice hockey stick handle designs, handle 12 is chanfered on all four corners as shown at 30, which chanfers terminate at the start of the tapered end portion 14 as shown at 32 in Figure 4.

The cross-section of filler 22 is not critical to this invention nor is the type of material used therefor. In a preferred embodiment, filler 22 is an I-shaped solid piece of softwood whose main purpose is to reduce the amount of foam plastic material required for the manufacture of handle 12. It also serves as a spacer during the manufacture of handle 12 as will be described below.

The presence of preformed reinforcing strips 24 and 26 ensures the required degree of longitudinal rigidity of handle 12, and the exact dimensions of reinforcing strips 24 and 26 as well as their compositions are basically a question of design to suit the needs of the players. Nevertheless, reinforcing strips 24 and 26 are preferably of constant rectangular cross-section and they are very thin as compared with the thickness of handle 12. They extend along the full length of the handle component and terminate just slightly inwardly of the corners 30. They also extend into the lower tapered end 14 and terminate at the thin bottom edge 36 which is at angle "x" with respect to the rear edge 38 of handle 12. Angle "x" determines the approximate angular relationship between blade 16 and handle 12, which angular relationship varies slightly among the various models of ice hockey sticks offered to hockey players to suit their particular requirements as in well-known in the art.

The foam injected plastic material may be any suitable foamable plastic such as polyurethane, polyethylene and polypropylene and the shape of tapered end 14 is obtained in the moulding operation by so constructing the cavity of the mold used for this purpose.

The process for making handle 12 uses the relatively well-known technique called rim molding which involves the use of a suitable mold (not shown) having any number of identical cavities whose shapes correspond to the desired shape of the finished handle component 12. The process involves placing in the bottom of the cavity of the mold a reinforcing strip 24,26, placing filler 22 over the first strip, and placing a second reinforcing strip 24,26 over filler 22 after which the mold is closed and the plastic material is injected. Heat is then applied in order to effect curing and foaming of the plastic material and then the mold is opened and the handle component 12 is removed. The sides 29 of the tapered end portion 14 may be abraded slightly by sanding in order to remove all impurities and provide some degree of rugosity for better adhesion of glue, and it is ready for the next operation.

Blade component 16 and handle 12 are then glued together using a strong glue such as epoxy resin or a suitable wood glue compatible with foam plastic and the material of which reinforcing strips 24 and 26 are made.

Blade component 16 is made of hardwood whose grain extends in the longitudinal direction as illustrated by arrow 40. A solid piece of hardwood may be used but it is preferred to use a series of strips of solid hardwood 41 to 46 extending longitudinally from end to end and glued together on their contiguous edges. It may taper in the longitudinal direction because the free end 47 of the finished product 10 may be considerably thinner than its region 48 adjacent the joint.

The outline of the blade component 16 is generally rectangular except its rear edge 50 which is cut at an angle equal to angle "x" of the tapered end 14 of handle component 12. A groove 52 is cut into rear edge 50 which conforms very closely to the shape of tapered end 14 of handle component 12. The depth of groove 52 is equal to the length of bottom edge 36 of handle component 12 and the inner walls of groove 52 are planar and strictly parallel to the mating surfaces of handle component 12. As a result, rear edge 38 of handle component 12 becomes flush with rear edge 50 of blade component 16 when tapered end 14 is glued in place into groove 52. Likewise, thin bottom edge 36 of tapered end 14 of handle component 12 is flush with bottom edge 53 of blade component 16 when the two components 12 and 16 have been permanentaly glued together.

The next step in the method of manufacture of ice hockey stick 10 involves cutting blade component 16 to the desired outline 55 illustrated by a dotted line in Figure 4 to produce the profile of the blade of the finished ice hockey stick 10. After that the blade portion is further sanded to reduce it to the finished thickness, and then it may be heated so as to curve it transversally after which reinforcement is applied by wrapping or applying glass fiber cloth which will be held in place by means of a coating of epoxy resin or other adequate coating which bonds together the fibers of the reinforcing cloth as is well known in the art. The ice hockey stick 10 may then be printed with various grade and quality indications and ornamentation may be applied as is current in the trade.

Thus, the invention provides a method of joining together a handle component and a blade component which may be adapted for using a molded foam plastic handle component reinforced with rigid strips of strong fibers, but the same joint is also applicable to handle components made of hardwood either in the form of a solid piece of hardwood such as ash and white birch or in the form of hardwood laminates, with or without reinforcing means such as reinforcing strips 24 and 26. In accordance with this novel joint, the blade is made of a piece of hardwood whose grain extends longitudinally of the blade from the tip thereof 47 to the front edge 59 of handle component 12 and over both sides 29 of tapered end 14. The resultant joint has proved to be surprisingly strong in spite of its simplicity and ease of manufacture, the only critical aspect of such a joint being the close conformity between tapered end 14 of handle component 12 and groove 52 of blade component 16.

The material used for making preformed reinforcing strips 24,26 which are normally produced by pultrusion techniques comprise fibers of glass, fibers of graphite or fibers of aramide or any combination thereof, suitably held together by an appropriate bonding agent such as epoxy resin.

The cross-section of filler member 22 shown in Figure 3 is I-shaped and this component is made of a solid piece of softwood on account of the fact that this material is cheap, light weight and easily available. Obviously other types of material could be used instead of softwood if such were available. Other configurations of filler can also be envisaged on account of the limited role played by this component and its only critical

dimension is that which determines the distance between reinforcing strips 24 and 26 when placed in the cavity of the mold prior to injection of the plastic material in liquid form. The dimension in question which, in the illustrated I-shaped embodiment of Figure 3, is the length of the transverse upper and lower bars 60 and 61 of I-shaped filler 22 must be sufficient to maintain proper distance between reinforcing strips 24 and 26 throughout the molding operation of handle component 22 in order to avoid, as much as possible, the presence of foam plastic on the outside of reinforcing strips 24 and 26 except if it was desired to completely cover these surfaces in which case a uniform covering would be required and particular care should be taken when so constructing a handle component. In principle, however, it is preferable to avoid the presence of such foam plastic over the surface of reinforcing strips 24 and 26 in order to produce a satisfactorily attractive finish product without the necessity of sanding the sides of the finished handle component. The outer surfaces of reinforcing strips 24 and 26 constitute a proper surface for applying decorative means and written inscriptions such as the name of the manufacturer or its trade mark and the model designation of each particular class of ice hockey stick. Thus, it is best to ensure that in the finished product the reinforcing strips 24 and 26 are flush with the adjacent plastic material inwardly of chanfers 30 as shown at reference numeral 65 in Figures 2 and 3.

It should be understood that the scope of the present invention is not intended to be limited to the specific preferred embodiment illustrated in the drawings and described above.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A handle component for making ice hockey sticks, said handle component having generally a rectangular cross-section and comprising a front and a rear side and two opposite lateral sides, said handle component further comprises :

- a body of foam injected plastic material of a suitable density and resistance,

- a longitudinally extending, centrally located filler member ; and

- centrally on each lateral side, a flush reinforcing strip of unidirectional strands of fibers in a suitable bonding agent.

2. A handle component as defined in claim 1 wherein the distance between said two opposite lateral sides defines the thickness of said handle component, each reinforcing strip is of constant rectangular cross-section and is very thin as compared with the thickness of said handle component.

3. A handle component as defined in claim 2 wherein each reinforcing strip extends along the full length of said handle component and terminates just slightly inwardly of the corners edging the lateral sides.

4. A handle component as defined in claim 1, 2 or 3 wherein one end of said handle component tapers inwardly on each lateral side thereof to a thin central edge cut at an obtuse angle with respect to the rear side of said handle component.

5. A handle component as defined in claims 1, 2 or 3 wherein the foam injected plastic material is one of the substances in the class comprising polyurethane, polyethylene and polypropylene.

6. A handle component as defined in claims 1, 2 or 3 wherein the foam injected plastic material is a substance chosen from the group consisting of polyurethane, polyethylene and polypropylene, and wherein said filler is a piece of soft wood disposed between said reinforcing strips and extending along substantially the full length of said handle component.

7. A handle component as defined in claims 1, 2 or 3 wherein one end of said handle component tapers inwardly on each lateral side thereof to a thin central edge cut at an obtuse angle with respect to the rear side of said handle component, wherein the foam injected plastic material is a substance chosen from the group consisting of polyurethane, polyethylene and polypropylene, and wherein said filler is a piece of soft wood disposed between said reinforced strips and extending along substantially the full length of said handle component but terminating short of said thin central edge, said filler having a constant I-shaped cross-section at least inwardly of the tapered end of said handle component and being coaxial relative to said handle component with the central member thereof

extending parallel to and equidistant from said reinforcing strips.

8. A handle component as defined in claim 1 wherein said fibers are chosen in the group consisting of fibers of glass, fibers of graphite and fibers of aramid or any combination thereof.

9. A method for making a handle component for an ice hockey stick, said handle component having generally a rectangular cross-section and comprising a front and a rear side and two opposite lateral sides, said handle component further comprising :

- a body of foam injected plastic material of a suitable density ;

- a longitudinally extending centrally located filler member ;

- centrally on each lateral side, a flush reinforcing strip of unidirectional strands of fibers in a suitable bonding agent ;

- said method comprising the steps of :

a) placing into the cavity of a rim injection mold a first reinforcing strip, said filler member over said first strip, and a second reinforcing strip over said filler member ;

b) closing said cavity ;

c) injecting a suitable volume of foam plastic material in liquid form into said cavity ;

d) heat curing said foam plastic material, and removing said handle component after heat curing.

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10. A process as defined in claim 9 wherein the sides of said cavity for making the lateral sides of said handle component contact said reinforcing strips prior to said heat curing step thereby to eliminate the presence of foam plastic material of said reinforcing strips on the finished product, said sides of said cavity so converging toward one another at one end of said cavity as to produce on the finished product an end which tapers inwardly on each lateral side thereof to a thin central edge forming an obtuse angle with respect to the rear side of said handle component.

11. A process as defined in claim 9 wherein said plastic foam material is one of the substances of the class comprising polyurethane, polyethylene and polypropylene.

12. A process as defined in claim 9 wherein said fibers are chosen among the class comprising fibers of glass, fibers of graphite or fibers or aramid or any combination thereof.

13. A process as defined in claim 9 wherein said plastic foam material is one of the substances of the class comprising polyurethane, polyethylene and polypropylene and wherein said fibers are chosen in the class comprising fibers of glass, fibers of graphite or fibers of aramid or any combination thereof.

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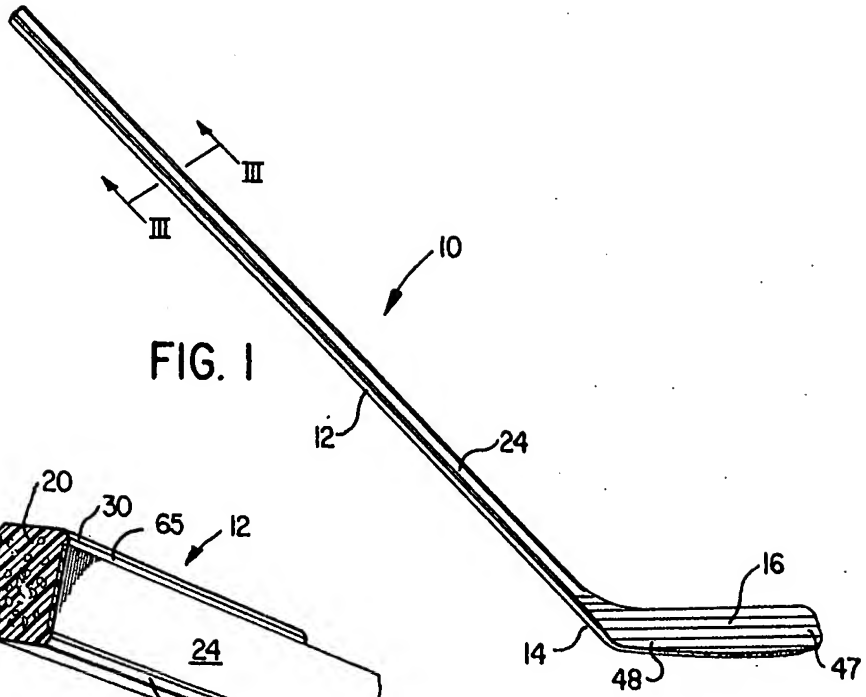

FIG. 1

FIG. 2

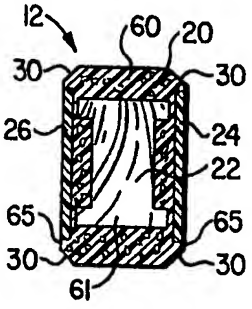

FIG. 3

FIG. 4

Goodreau Page Dubuc & Martineau Walker